

Modeling a City

- What is Google Earth Modeling?
- Useful Tools
- Useful Resources
- Terminology
- Taking Pictures
- Building a Model
- Photo Texturing
- Geo-Modeling Checklist
- Uploading Your Model
- Best of 3D Warehouse
- SketchUp Tips
- Photoshop Tips



A Guide for Creating Your Google Earth Environment

What is Google Earth Modeling?

Google Earth is an online environment that performs best when models are created with this in mind. A well constructed model will load quickly and allow Google Earth to perform to its highest potential.

All geo-referenced models go through an internal review process before being included in the “Best of the 3D Warehouse” layer in Google Earth. Following this guide is best way to get your models included in the layer!

Keys to Success

- Maintain accuracy in scale and location
- Focus on the important and identifying details
- Show small, intricate details through photo textures
- Keep a low polygon count
- Make it beautiful



Useful Tools



Google SketchUp

<http://sketchup.google.com>

3D modeling tool



Google Earth

<http://earth.google.com>

3D interactive earth browser



3D Warehouse

<http://sketchup.google.com/3dwarehouse>

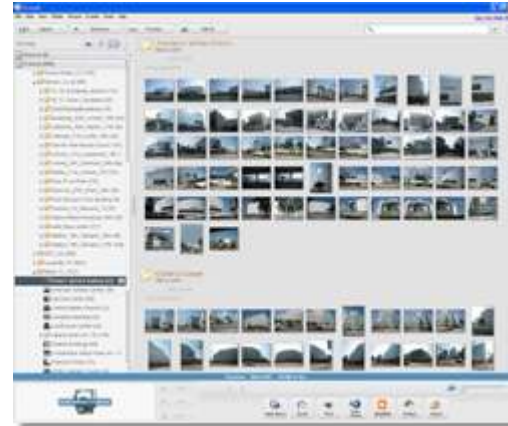
Online collection of 3D content



Adobe Photoshop

<http://www.adobe.com>

Advanced photo editing



Picasa

<http://picasa.google.com>

Photo editing and organization

Useful Resources



Google Search

<http://www.google.com>

Many searchable categories



Emporis

<http://www.emporis.com>

Building heights and details



Archiplanet

<http://www.archiplanet.org/>

Building encyclopedia



Wikipedia

<http://www.wikipedia.org>

The free encyclopedia



Skyscraperpage

<http://www.skyscraperpage.com>

Building heights, diagrams and forums

Terminology

Edge or Line

- Geometry that divides and borders faces.

Face or Polygon (Poly)

- A two-sided, flat surface bound by at least three lines.

Texture or Material

- Images or colors that are applied to faces.

Tiled Texture

- An images that repeats across a face. "Tiling" creates textures.

Alpha Transparency

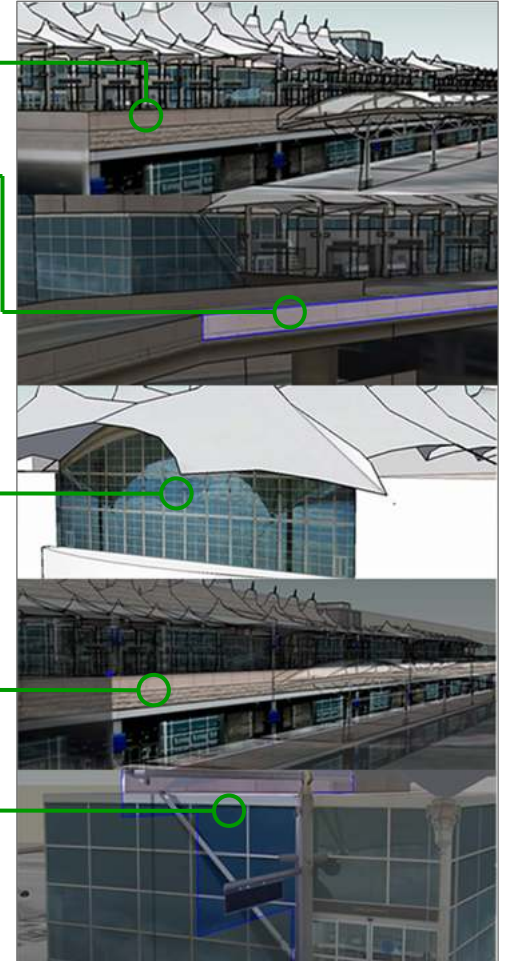
- The use of transparency in an image.

Low Poly

- Using a minimal number of edges and faces to limit file size and increase computer performance.

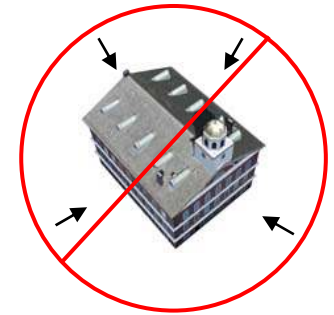
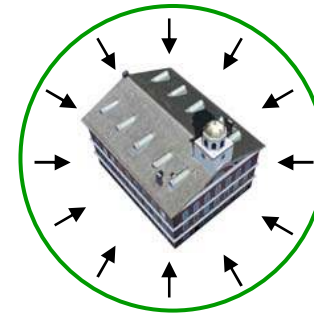
File Size

- The amount of space your file uses on your computer. Models must be under 10MB to be uploaded to the 3D Warehouse.



Taking Pictures

- Take LOTS of pictures! You will need every façade, including alleys and courtyards.
- Shoot around obstructions when you can, like trees, people, cars, etc.
- Include the context. Show the building in its surrounding area.
- Include corner shots for use in matching a photo.



Get detail shots.



Take context pictures to help place the building.



Take multiple pictures of each façade.



Take multiple photos of long façades if they are too difficult to get in one shot. You can use a photo editor to stitch them together later.

Building a Model

Creating a successful model means creating one that accurately represents the building and also loads efficiently into Google Earth. Models with simple geometry and web ready textures will load quickly into an online environment such as Google Earth.

- Getting started
- Simple modeling
- Components
- Grounding your model
- Clean up

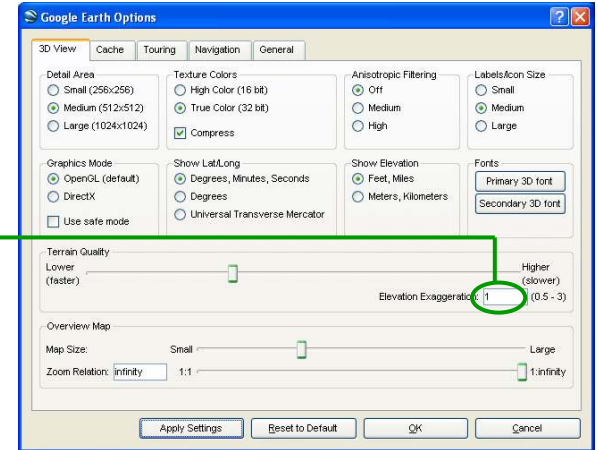


Building a Model

Getting started

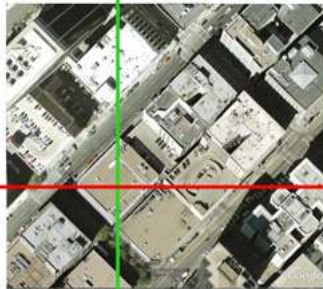
Open Google Earth.

- Find your building in Google Earth. Press the “R” key to align North to the top of the screen, giving a direct overhead (plan) view.
 - Be sure the Elevation Exaggeration is set to 1 in the Tools -> Options menu.
 - Be sure your terrain layer is check-marked.
- Save the image without changing your position. You will use this as your roof texture. File -> Save -> Save Image



Open Google SketchUp

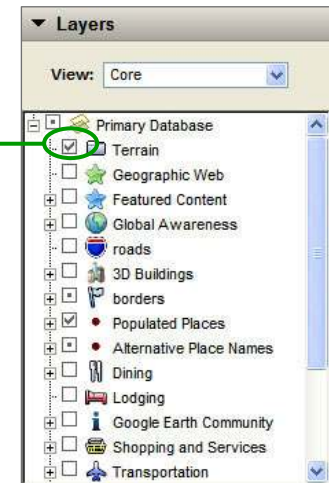
- Import terrain using Get Current View tool in SketchUp.
- Align the axes to match your building by using the Axes tool.



Incorrectly aligned axis



Correctly aligned axis

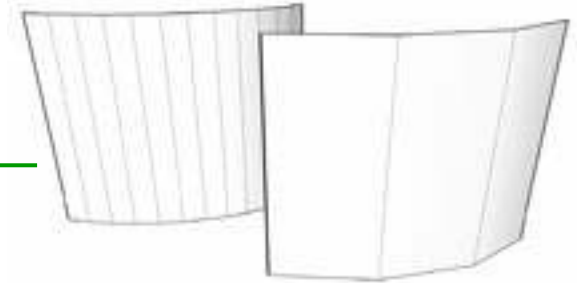


Building a Model

Simple modeling

- Simplify the curves. Fewer faces means smaller file size and better performance.

Curves are made of line segments in SketchUp. To simplify while drawing an arc or a circle, just type a number and "S" then hit Enter.



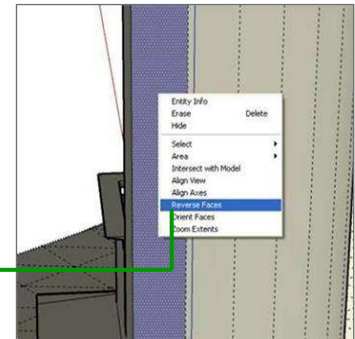
- Many 3D building features can be portrayed in 2D.

This complex looking shape is actually composed solely of flat faces with no depth. This is a good technique for adding detail while keeping it simple.



- Proper face orientation.

Each Face has two sides. Make sure the front (light) side of the face is outward. To view face orientation, View -> Face Style -> Monochrome
To reverse a face, Right click -> Reverse Faces



Building a Model

Components

Use components for repetitive building features. SketchUp treats components as instanced entities, thus they load faster and help make files smaller.

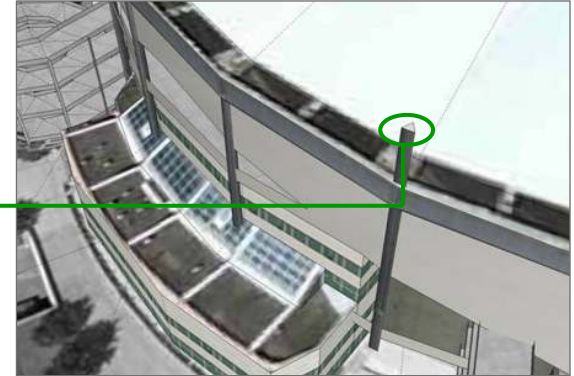
- Select geometry
- Edit -> Make Component



Remember to keep these low poly too.

This column only has three sides. The top and bottom faces have also been deleted.

Remember: if you are adding a texture to a component or a group, you must double click to edit the object before you can apply the texture.

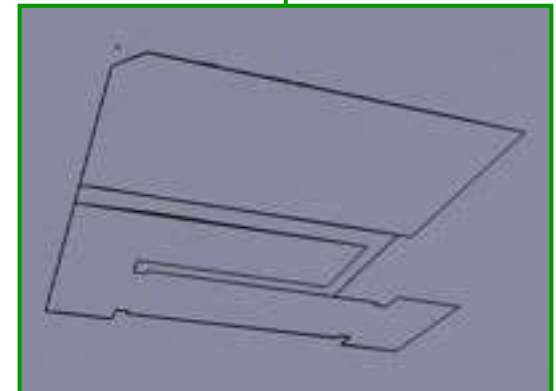


Building a Model

Grounding your model

- Make sure your model is sunk into the Google Earth terrain. Toggle the terrain on and off with the Toggle Terrain icon (See [Advanced User Tips](#) for more terrain tips).

Toggle the terrain on and off with the Toggle Terrain icon. Then move your building vertically so that it sits in the ground.

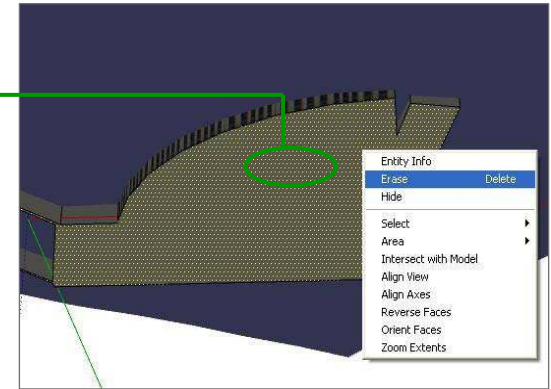


Building a Model

Clean up

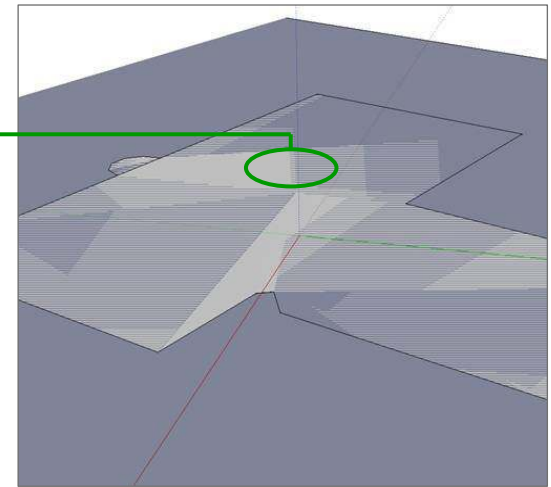
- While modeling, delete non-visible faces and erase extra lines.

Try to create models which are a hollow shell, without any internal lines or faces.



- If you see flickering faces in your model, you are experiencing Z-Fighting.

Z-Fighting is a sign of excess geometry and should be eliminated by deleting the excess faces.



- PURGE! Purge your model to cleanse it of unused textures and components. Window -> Model Info -> Statistics -> Purge Unused

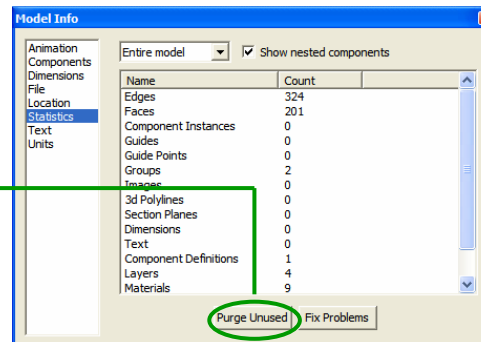


Photo Texturing

Photo texturing allows you to apply photographs onto your model. This will improve your model, make it realistic, and keep the polygon count low. One photograph may yield several unique textures, while others may be used only to aid in the creation of your model.

- Applying a texture
- Positioning texture
- Matching the best photo
- Matching a photo
- Tracing a matched photo



Photo Texturing

Applying a texture

- Using Picasa, crop your image as much as possible without losing any of the building.
- In SketchUp, select File -> Import, select your image, choose "Use as texture" and then open.
- Click on the face you wish to apply the texture to. Then stretch the texture across the face and click again.



Photo Texturing

Position texture

- Edit your texture by right clicking on the face and choose Texture -> Position.
- There are four pins on the image. Click on a pin once to pick it up then move it to a desired corner on the texture. Repeat for the remaining pins and corners.
- Right click on the image and uncheck the "Fixed Pins" option. Then click and drag the pins to the corners of the model.
- Press Enter to finalize texture position.
- Remember to place the roof texture in the same way. Use the Google Earth terrain image you saved earlier and position it on the building. It's the easiest and most accurate way to show the roof.
- For more photo texturing options and techniques, see [Advanced User Tips](#).

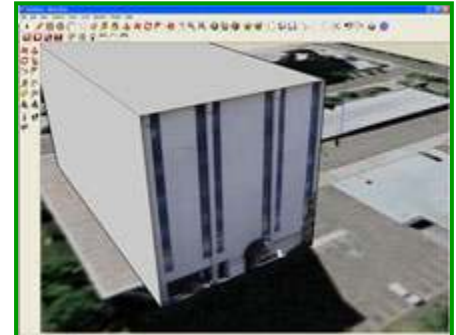
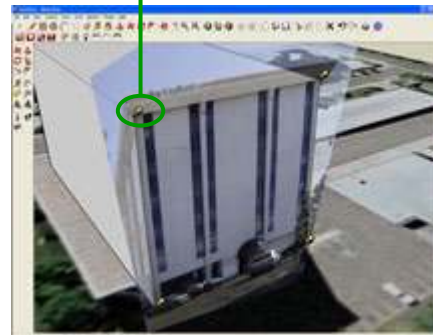
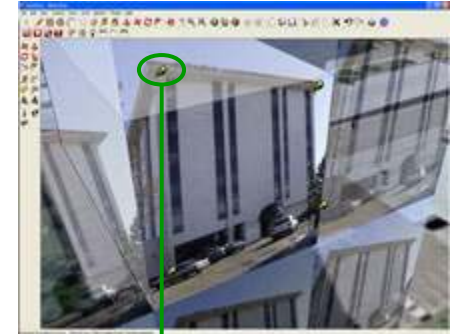
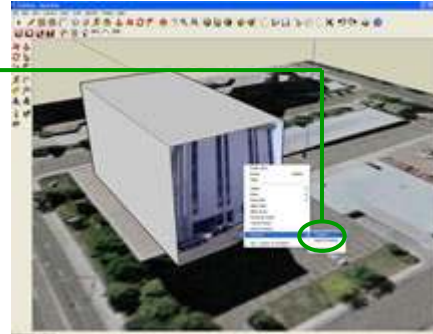
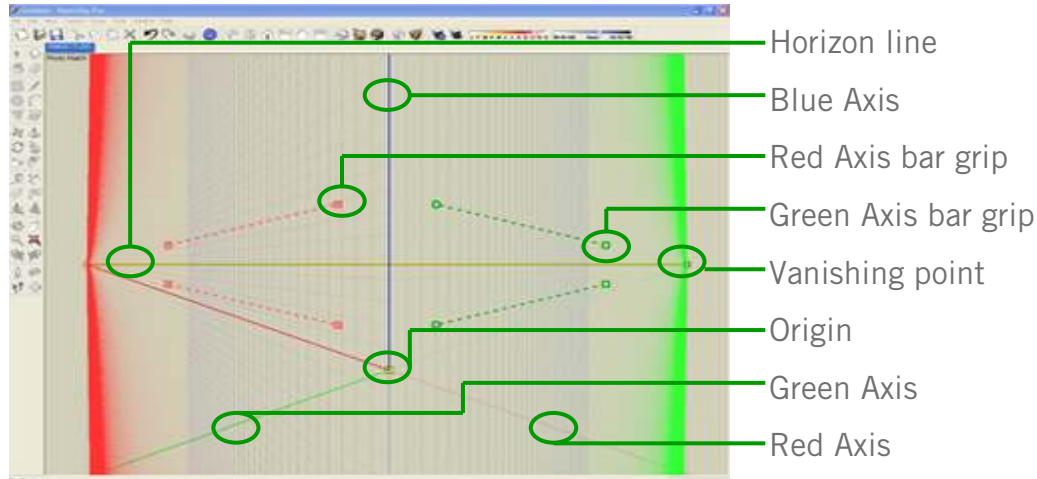


Photo Texturing

Matching the best photo

Matching a photo in SketchUp is the process of setting your model view to match the view of a picture that you took.



- Find a picture of your building that shows a two point perspective (a corner shot).
- Import your terrain from Google Earth and trace the footprint of your building.
- Look at the picture you selected. Align your axis in SketchUp so that the origin sits on the matching corner as shown in your picture.

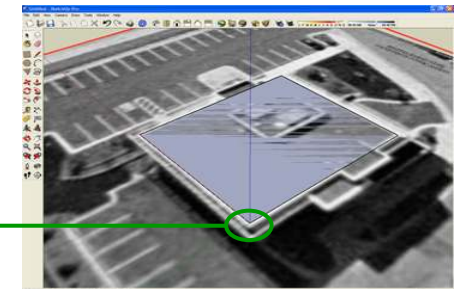


Photo Texturing

Matching a photo

- File -> Import, select your image, choose “as new matched photo” and then click open...

Don't panic.

- Move the origin to the matching corner on your image.

- Align the Green and Red bars with horizontal lines on the building in the image.

Be sure to not align to the ground as it may not be horizontal.

- Move the mouse over the blue axis and click and drag to zoom. Match your traced footprint with the building in your photograph.

- Click Done.

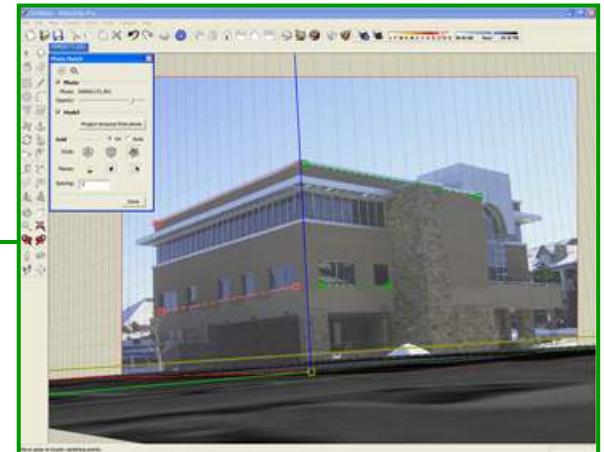
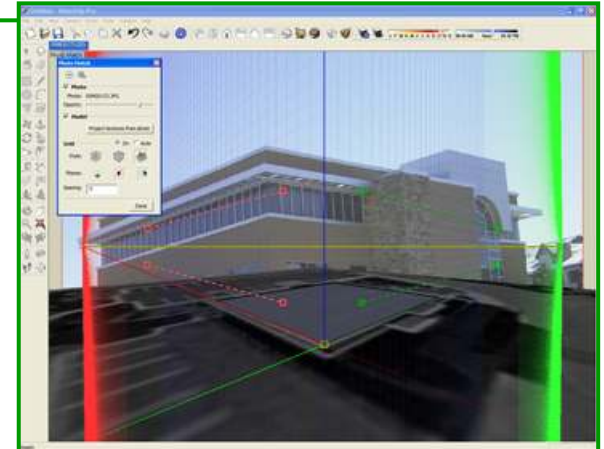


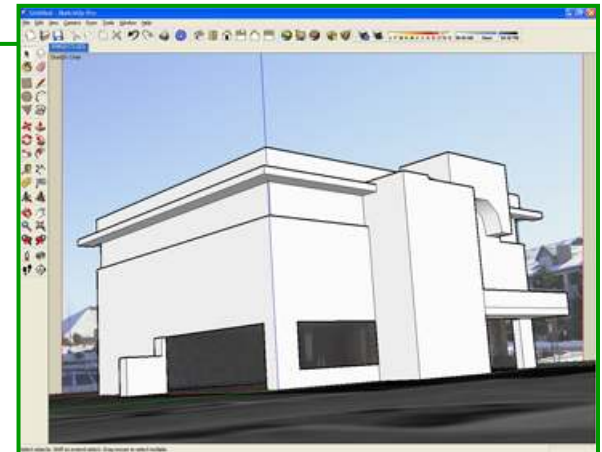
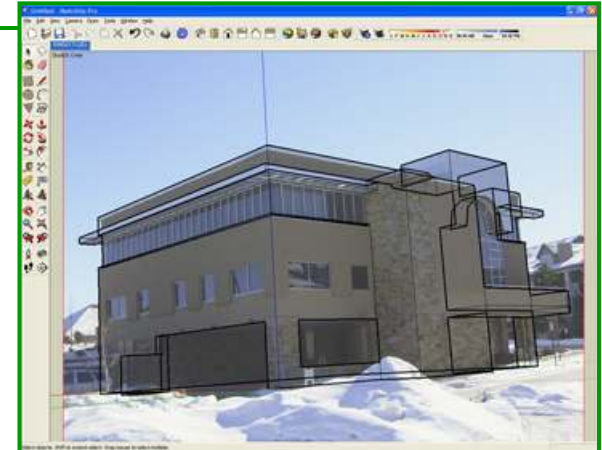
Photo Texturing

Tracing a matched photo

- Now you can trace the building outline. Remember only to pan and draw; orbiting will close the photo matching option. You can get back to the matched photo by clicking on the scene tab at the top of your model window.
- After you have finished tracing your picture, click "Project textures from photo" or right click -> project photo on a specific face to texture your newly made model.
- If you match your model to a new photo, you must redefine the axes and origin.

Wireframe


Shaded

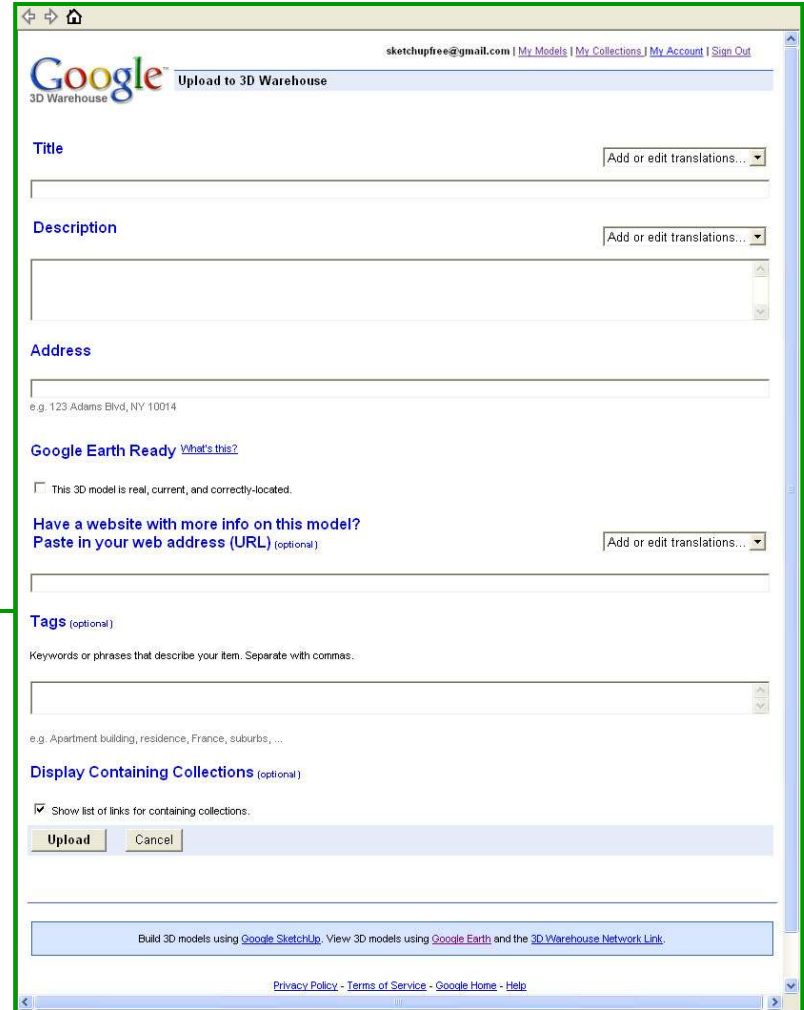


Geo-Modeling Checklist

- ❑ Delete extra geometry inside and outside of your building.
- ❑ Turn hidden geometry on, View -> Hidden Geometry, and check for excess hidden lines.
- ❑ Make sure your building is aligned with the base of the building in your Google Earth snapshot.
- ❑ Toggle the terrain button and confirm that your building is planted in the ground.
- ❑ Export your model to Google Earth, File -> Export -> 3D Model and choose Google Earth 4 (.kmz).
- ❑ Open the .kmz in Google Earth to check that it accurately represents the building.
- ❑ Make sure your SketchUp file is under 10MB for a successful upload to the 3D Warehouse.
- ❑ Try for a minimal number of faces (polygons), Window -> Model Info -> Statistics. Less than 500 is ideal for most buildings.

Uploading Your Model

- In SketchUp, hide your lines and profiles for a cleaner screenshot. View -> Edge Style -> uncheck Display edges and Profiles.
- Position your view on screen so that it is attractive. This will become your screenshot in the 3D Warehouse.
- Click on the “Share Model” button. 
- Set up a Google Account if you don't already have one.
- Fill in as many fields as you can with information about the building you modeled. Useful information like city name, architect, building materials, etc. help people find your building on the 3D Warehouse.
- Make sure to check the “Google Earth Ready” checkbox.
- Click Upload!



The screenshot shows the 'Upload to 3D Warehouse' form in a browser window. The form includes the following fields and options:

- Title:** A text input field with a dropdown menu for translations.
- Description:** A text input field with a dropdown menu for translations.
- Address:** A text input field with a placeholder example: "e.g. 123 Adams Blvd, NY 10014".
- Google Earth Ready:** A checkbox labeled "This 3D model is real, current, and correctly-located." with a link "What's this?".
- Have a website with more info on this model?:** A checkbox with a dropdown menu for translations and a text input field for the URL.
- Tags (optional):** A text input field for keywords or phrases, with a placeholder example: "e.g. Apartment building, residence, France, suburbs, ...".
- Display Containing Collections (optional):** A checkbox labeled "Show list of links for containing collections.".
- Buttons:** "Upload" and "Cancel" buttons.
- Footer:** A blue bar with the text "Build 3D models using [Google SketchUp](#). View 3D models using [Google Earth](#) and the [3D Warehouse Network Link](#)." and a link to "Privacy Policy - Terms of Service - Google Home - Help".

Best of the 3D Warehouse

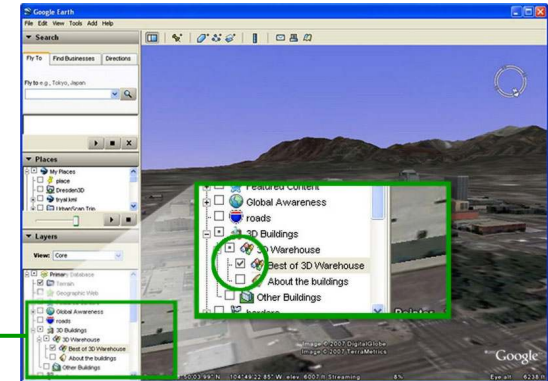
After uploading, your geo-located model is on its way to the “Best of the 3D Warehouse” layer in Google Earth. Here is how you find out if you made the cut.

- Check to see if your model has a blue Google Earth ribbon on the 3D Warehouse.



- In Google Earth, turn on the Best of the 3D Warehouse layer and fly to your buildings location.
- Your building should appear along with a little yellow house that shows you more information.

Models will not appear in the layer immediately. They must go through a review process before being selected. Please allow up to 30 days for this process.



SketchUp Tips

SketchUp tips and tricks

- Ground effects
- Curves and projections
- Hide and unhide



SketchUp Tips

Ground effects

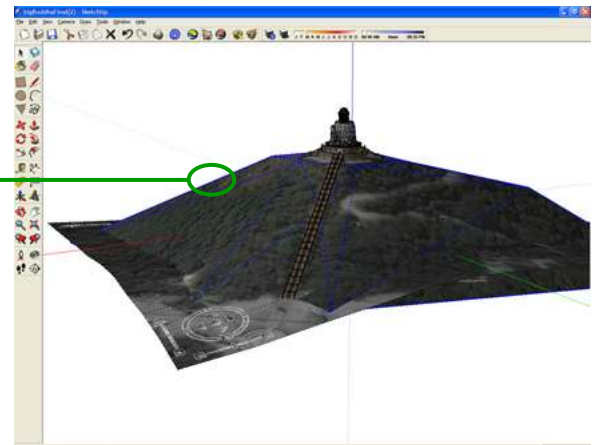
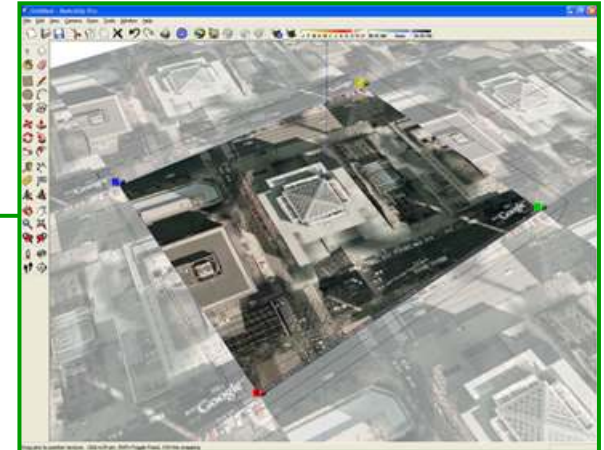
- Adding color to your imported Google Earth terrain.

<http://sketchupdate.blogspot.com/2007/06/adding-color-to-your-earth-snapshots.html>

- Make sure to save an image from Google Earth at the same time you import your terrain into Google SketchUp.
- Unlock your terrain, right click -> Unlock.
- Double click to enter the group.
- Insert image you saved at the same time you imported your terrain. Place it on the terrain.
- Position the texture by dragging corners of the image to match the corners of the face.

- Modeling terrain.

- Sometimes the terrain in Google Earth does not match the actual terrain. When this happens you can model the terrain in Google SketchUp. Remember to keep it as low-poly as possible and to project the Google Earth ground texture onto your new terrain.



SketchUp Tips

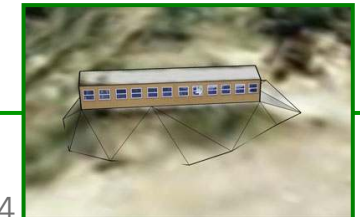
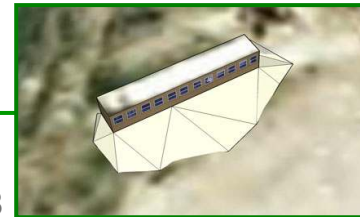
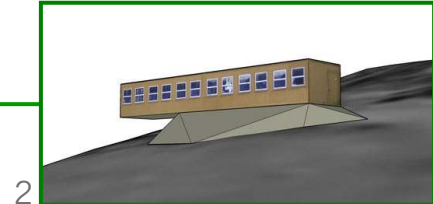
Creating Terrain

- If your building seems to float above the terrain when you toggle it on, add terrain in SketchUp. Keep in mind added terrain needs to use the fewest polygons as possible.

- Toggle on the terrain.
- Move the building so the correct part is sitting in the ground. This probably means other parts are floating.
- Using the line tool, create connections with the bottom edges of the building and the terrain. If you see "On Face," you can rest assured you are actually connected to the terrain.



- When you are finished, paint the projected image of the Google Earth terrain on the new terrain.
- Your building will now be placed in accurate terrain with an accurate texture.



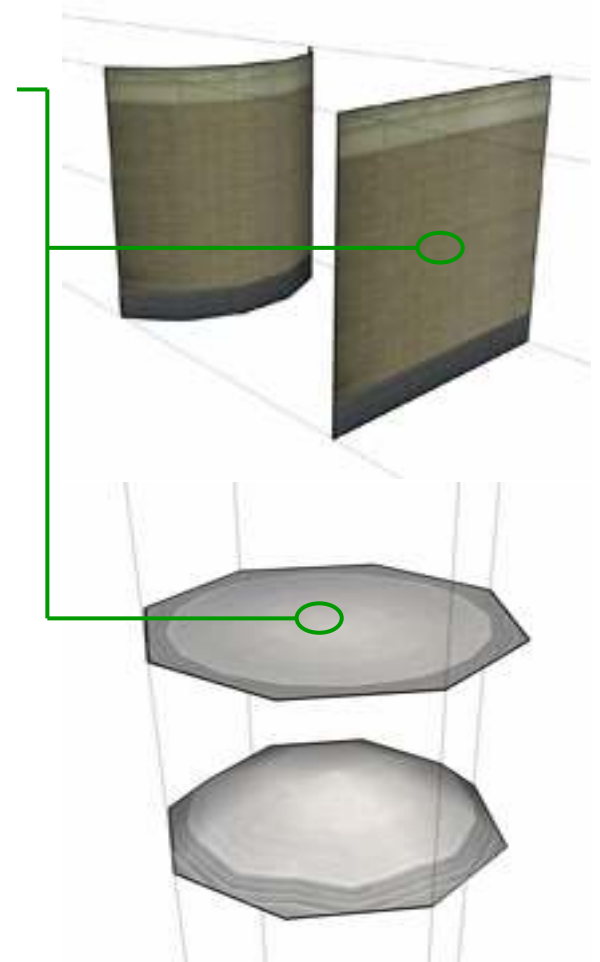
SketchUp Tips

Curves and projections

- Projecting textures

- Right click on a texture and choose projected. This can be helpful for applying images to curved or angled faces.

Remember when projecting textures you want the source texture to be at the normal to the curve.



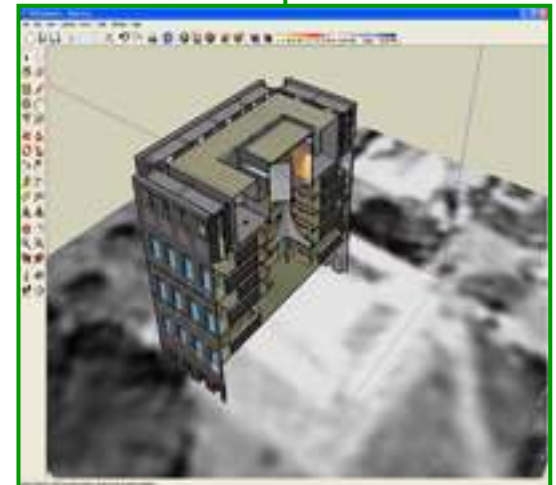
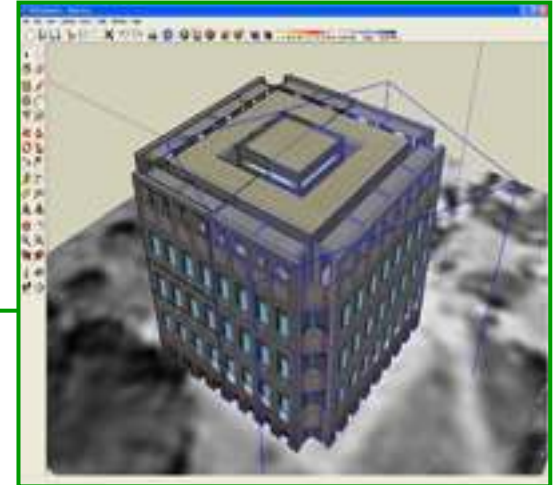
- Softening your curves

- If you draw something that needs smoothing, you can do so by selecting the Eraser tool then hold down the Ctrl key while erasing the edges.

SketchUp Tips

Hide and unhide

- Use hide and unhide to speed up computer performance.
 - If you are experiencing slowdowns due to large file size, hide parts of the model you are not working on. Your computer should run more smoothly. You can unhide them when you need to reference them again.
- You can also hide unlocked terrain, right click -> Unlock.
- To view hidden geometry, View -> Hidden Geometry.



Photoshop Tips

A photo editor, like Adobe Photoshop, can be useful to edit photos before applying them to the model.

- Crop out perspective
- Color correction
- Edit out obstructions
- Advanced textures
- Adding to textures
- Saving for web use



Photoshop Tips

Crop out perspective

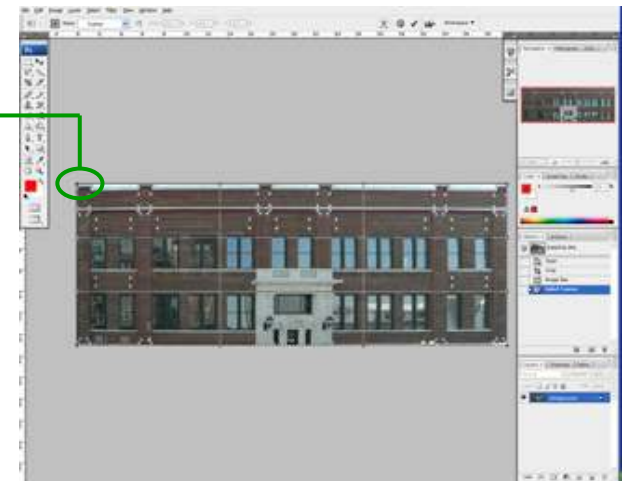
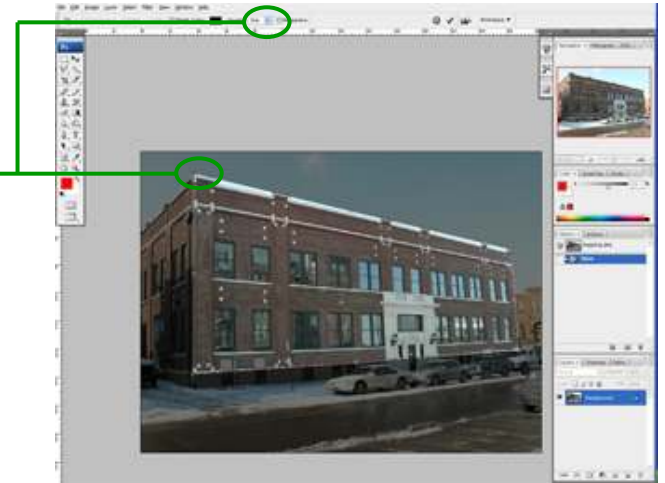
- Click on the Crop tool. After starting the crop, click the “Perspective” checkbox at the top of the screen. This will allow you to move corners of the crop box to match the perspective of the facade in your photo.
- Hit Enter to crop. Sometimes the crop tool leaves a bulge in your image caused by the camera lens. Use the Warp tool.

Using the Warp tool:

- “Ctrl + A” to select everything.
- “Ctrl + T” to start transforming.
- Right click and select Warp.
- Use the anchor points or just click and drag on the image to warp out curves.
- Hit enter to end the transformation.

Using Lens Correction filter:

- Start with un-cropped image.
- Select Filter -> Distort -> Lens Correction
- Use “Remove Distortion” slider to correct the lens distortion. For typical point and shoot cameras, a value of 4 (four) will work well.



Photoshop Tips

Color correction

Color correction can be difficult, but there are a few easy tools that can have remarkable results.

Quick Mask, "Q" Key:

The Quick Mask changes all actions to create areas which are masked (from selection). These show up in red.

- Press "Q" Key.
- Press "Gradient tool" and make a gradient.
- Press "Q" Key again.
- Now you have a selection that is a gradient that you can use to offset a gradient in your image.

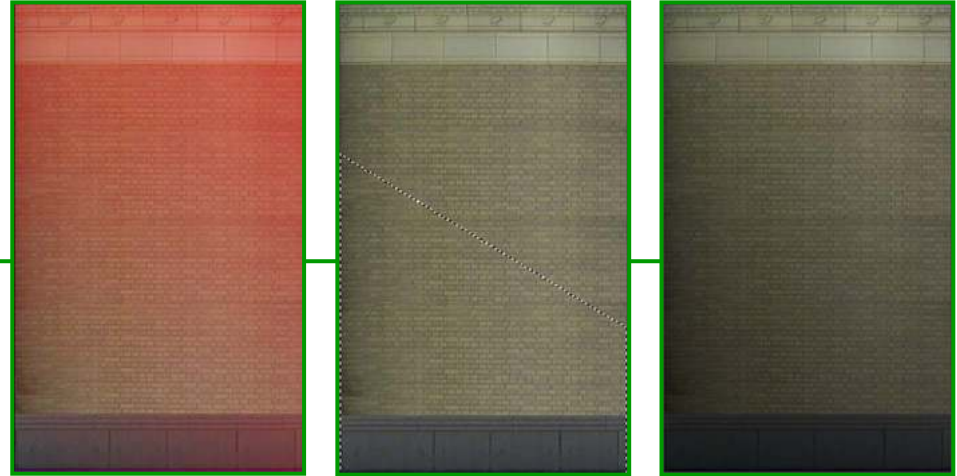


Image -> Adjustments -> Brightness/Contrast

- Use sliders to adjust the brightness and contrast.

Image -> Adjustments -> Hue/Saturation

- Use sliders to adjust hue and saturation.

Dodge and Burn:

- Use the Dodge tool to add brightness with a brush.



- Use the Burn tool to subtract brightness with a brush.



Photoshop Tips

Edit out obstructions

Use the selection and cloning tools to edit out obstructions.

- Use the Marquee tool to select an area:



- Switch to the Move tool.

- Hold Alt and copy + drag your selection to cover obstructions with similar parts of the photo.

- Adding a feather to your selection can help blend any lines that you don't want to appear in your texture.

- Using the Clone Stamp tool:



- Press the Alt key and use the cursor to select a source point.

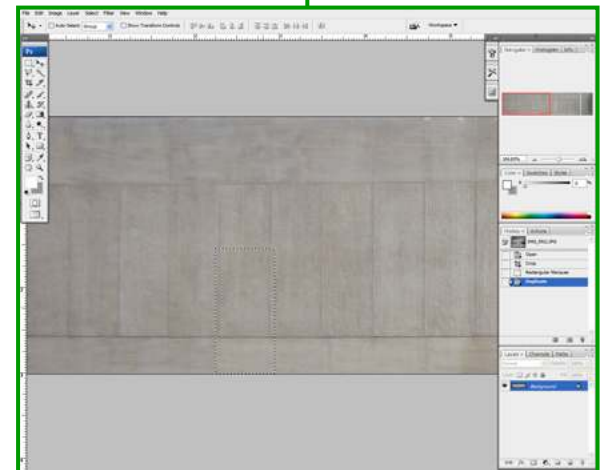
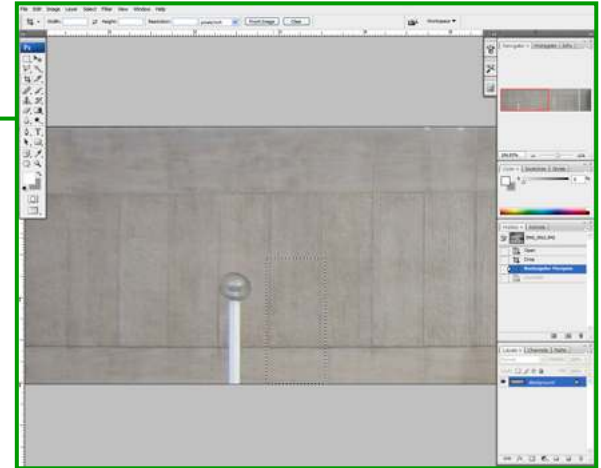
- The tool then works like a brush that paints from your source point.

- Using the Healing Brush tool:



- Press the Alt key and use the target to select a source point.

- The tool then works to blend out imperfections.

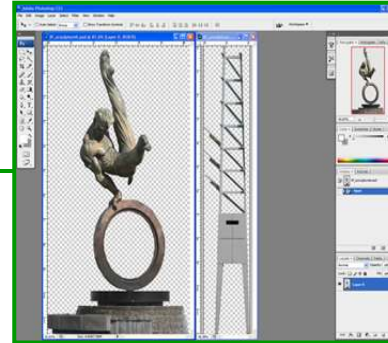


Photoshop Tips

Advanced textures

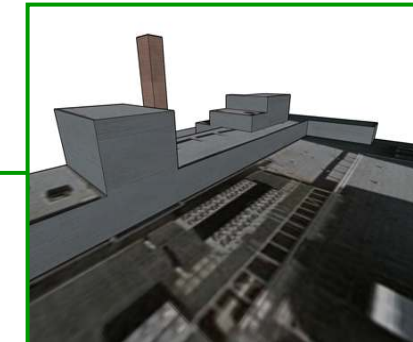
- Using alpha transparencies:

- Unlock your background layer (double click on the layer) and erase the unwanted areas of the image with the Eraser tool or by selecting and deleting areas.
- Save the image for web and select PNG-24.
- Make sure to sample-paint your texture to the back side of face you put it on in SketchUp.



- Making a tiled image:

- Crop out a section of the image to use for tiling.
- Use the Offset filter, Filter -> Other -> Offset, to offset your cropped image both horizontally and vertically. The Offset filter will move your image over the specified value and wrap the excess on the other side of the image.
- Edit out the edges so that your image flows seamlessly in each direction.



Photoshop Tips

Adding to textures

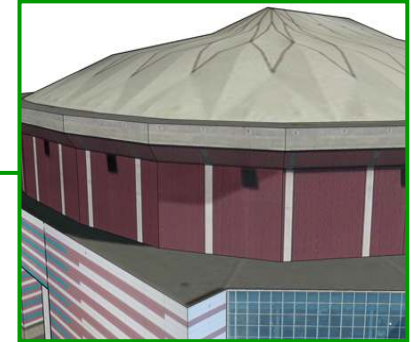
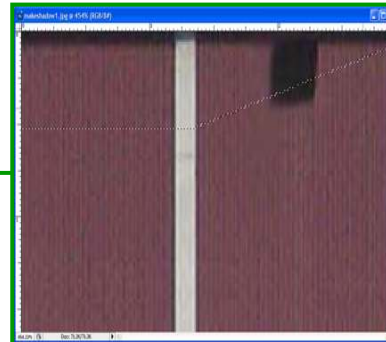
- Adding a reflection:

- Place the desired reflection as a new layer in your file.
- Lower the transparency until it looks believable.
- Use the eraser tool or other selection methods to take out any building features that would not reflect.



- Adding a shadow:

- Use the Lasso tool or other selection methods to draw your desired shadow.
- Right click and add a feather to your selection.
- Use the brightness/contrast to create a shadow.



Photoshop Tips

Saving for web use

Saving for web is useful because it optimizes textures for faster use in web applications.

- File -> Save for Web
- Choose JPEG (PNG 24 if you have a transparency).
- There are two ways to optimize the file size:
 - Decrease the quality slider
 - Click on the "Image Size" tab
 - Change the size of the image (this will only change the size of the file you save, it will not edit the file you have been working on).
 - This shows you what the file size will be at the current settings.

